International Day against Drug Abuse and Illicit Trafficking—26 June

United Nations Decade against Drug Abuse 1991–2000

DETECTING DRUG CROPS FROM SPACE

Illicit narcotic drug production, trafficking and abuse continue to threaten political institutions and economies, especially as a result of escalating drug-related violence. Law-enforcement officers, journalists, judges and politicians—including a presidential candidate in Colombia—have been slain by narcotraffickers in a campaign of terror that has placed democratic institutions in Colombia and Peru virtually under siege.

This assessment comes from the 1990 annual report of the International Narcotics Control Board.

Traffickers are not only well financed and heavily armed, the report says, but have become more innovative and better organized. During 1990, trafficking organizations in South America and Western Europe may have been using each others' routes in a joint venture to smuggle cocaine to Europe and heroin to North America. The current abundant supply of heroin makes this development particularly ominous, says the report.

SATELLITE DETECTION

To counter the drug threat, the Division of Narcotic Drugs of the United Nations International Drug Control Programme is promoting a range of new technologies. One of them is the use of satellites to detect illicit drug cultivation.

To foster the use of this technology, the Vienna-based Division convened a Meeting of Experts on the Detection of Illicit Cultivation of Narcotic Plants by Remote Sensing, held in Vienna in October 1989. The meeting was attended by specialists selected on the basis of their experience and expertise relating to the application of remote-sensing techniques.

The experts stressed the value of detection of drug crops by remote sensing, which can provide information on the location and extent of cultivation, and serve as a barometer to gauge the extent of eradication over time.

Ongoing projects illustrate the importance of this technique. In a pilot project in India, visual interpretation and digital analysis of satellite images taken at the right time in the crop cycle has made it possible to identify illicit poppy fields in remote areas.

In Brazil, remote sensing has been successfully used in two main regions of drug crop cultivation. These are the semi-arid north-east, where cannabis was found, and Western Amazonia, an area of tropical rain forests, where coca bush plantations have been located along the border with Colombia, Peru and Bolivia. In Amazonia, illicit coca cultivation was identified through the detection of the topographical changes it caused, such as the presence of airstrips and other activities related to its cultivation.

In Thailand, poppy growers tend to congregate, making their detection by remote sensing possible in spite of the small size of the individual plots.

Today three countries have remote sensing capabilities to acquire satellite imagery for the identification of narcotic crop cultivation. These are France using the Spot system, the Soviet Union by means of the Kosmos platform, and the United States through Landsat TM. Japan and the European Space Agency in 1991, and Canada in 1994, plan to launch platforms that will permit the collection of high-resolution images.

Airborne synthetic aperture radar (SAR)—a kind of radar photography—can be applied to identify crops and monitor vegetation. This technology has several advantages, including that of penetrating cloud cover, the experts said. SAR imagery will be routinely available with the launching of satellites by the European Space Agency, Japan and Canada in 1991 and 1994.

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ENVIRONMENTAL HAVOC

Using aerial photographs, several experts showed the vast environmental damage caused by drug plant cultivation. The slash-and-burn clearing technique, commonly used to prepare new ground for drug crops, is becoming a major cause of deforestation, soil erosion and changes in river flows.

Cultivation of coca in Peru and Bolivia and of cannabis in Jamaica is causing extensive environmental damage. About 80 per cent of the deforestation in Peru's Huallaga region is associated with cultivation of the coca plant. Coca growers are often migrants from the city, rather than local farmers. They are attracted to drug cultivation by the possibility of high and quick profits.

Deforestation and soil erosion are becoming acute problems, especially in areas where drugs are grown on steep slopes in difficult mountain terrain to evade detection.

Even after successful crop eradication programmes, it is difficult to carry out reforestation or crop substitution, owing to depleted soil nutrients and the intensive use of herbicides associated with illicit drug cultivation.

The unconsidered use and dumping of chemicals and other substances used to produce drugs causes devastating pollution. In particular, the extensive use of sulphuric acid, paraffin and other chemicals to prepare coca paste pollutes water systems. In Amazonia, this has resulted in damaging and sometimes irreversible effects on aquatic life in the Amazon estuary.

DRAWING UP A PROJECT

The experts felt that the entire world scientific community involved in remote sensing should be mobilized under the auspices of the Division of Narcotic Drugs within a project designed to improve knowledge of drug crops.

Should sufficient financial resources be made available, the project proposes to give priority to the identification of coca bush and poppy cultivation which, unlike cannabis, are restricted to specific regions, given their need for particular environments (i.e. climate, soil, altitude and the like). Countries where these plants are cultivated have been identified with a view to selecting test sites.

All data systems should be used in a complementary manner, the experts stressed. For eradication purposes, detection and analysis should be carried out as swiftly as possible.

Monitoring drug crops by remote sensing requires the use of geographic information systems integrating data from other sources. Such systems should include data on climate (temperature, rain), topography (altitude, slope) and cartography (roads, tracks, dwellings and waterways). They should also include a calendar of the different crops grown in the area with their spectral characteristics, and signs of deforestation and environmental degradation.

The project should make it possible to evaluate the different ways the data are treated. It should also provide information on the properties of drug crops and adjacent crops in such a way as to set up a data bank on their different characteristics.

In the first phase of the project, remote sensing should be accompanied by inspection on the ground at selected sites, to verify the accuracy of information interpreted from satellite imagery.

GETTING OPERATIONAL

The United Nations Commission on Narcotic Drugs endorsed the recommendations of the group of experts in February 1990. The United Nations General Assembly, at its special session on drugs that month, suggested using satellite imagery and aerial photography for drug crop surveying and monitoring, with the agreement of the Government concerned.

Following these endorsements, the Division of Narcotic Drugs has invited donor Governments to submit project proposals, to be drafted in cooperation with countries where illicit narcotic crop cultivation takes place. The European Community, France, Germany, the Soviet Union and the United States have expressed interest in the project. Both

the European Space Agency and the Soviet Union have offered to provide data-sets free of charge.

The Division of Narcotic Drugs has defined the parameters to be used for data processing and the methodology for evaluating the results.

Operational systems to monitor illicit cultivation are being proposed for selected countries in South-East and Central Asia and Latin America, subject to their approval and cooperation.

The project is estimated to take 36 months to implement. The data are to be collected by the KA 1000, Spot, Landsat and Air Radar satellites. The test sites will cover an area of about 2,500 square kilometres.

Technical responsibility for the project could be assumed by the Remote Sensing Centre of the Food and Agriculture Organization of the United Nations, assisted by experts appointed by the Division of Narcotic Drugs.

In addition, several countries have the capability to analyse the data. Among them are Canada, France, Germany, Japan, the Soviet Union, Sweden, the United Kingdom and the United States.

The total cost of data collection per site was estimated in 1989 to be $116,000, while the total cost of the project for five sites has been estimated at $890,000. The project will provide a methodology that could be extended to countries throughout the world.

Published by the United Nations Department of Public Information
DPI/1132—91-12419—April 1991—5M

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DESTROYING DRUG CROPS WITHOUT HARMING THE ENVIRONMENT

"World annual production of just one narcotic drug—cocaine—has recently been estimated to be. . . more than enough to provide a daily dose for every human being on earth," says a United Nations report released in October 1990.

"Illicit drug production and consumption figures continue to soar," the report adds, and defines drug abuse, production, supply and trafficking as major problems facing mankind.

To fight this scourge, the United Nations is evaluating new technologies for the environmentally safe eradication of narcotic crops—coca, the opium poppy and cannabis—for future application by interested parties.

To further such technologies, the United Nations convened at Vienna in December 1989 a Meeting of Experts on Environmentally Safe Methods for the Eradication of Illicit Narcotic Plants. The meeting was attended by experts from 10 countries and by representatives of several international organizations.

SOCIO-ECONOMIC ASPECTS

Strictly speaking, socio-economic aspects were beyond the terms of reference of the meeting. But several experts insisted that they be discussed, to draw attention to the difficulties that eradication strategies could face.

To counter the cultivation of drug crops, the social, cultural and economic dimensions of the problem must be considered, the experts said. The eradication of drug crops should be accompanied by crop substitution and rural development programmes to improve living conditions.

Persuading farmers that they can make a good living without resorting to narcotic crop cultivation requires the adoption of commercial and trade measures to improve their market opportunities. As long as the real factors underlying drug production are not recognized, the roots of the problem will not be properly attacked.

ENORMOUS IMPACT ON THE ENVIRONMENT

In the last 10 years, narcotic crop production has greatly increased, the experts stated. Production figures available to the international community probably vastly underestimate the scale of the problem. Its seriousness can be seen for instance in the case of Peru, where the area devoted to growing coca rose from 13,000 hectares in 1972 to more than 200,000 hectares in 1989.

Coca production has an enormous impact on people and on the environment. In Peru alone, an estimated 30,000 tonnes of sulphuric acid, 2,000 tonnes of calcium carbonate and 50 million litres of kerosene are used annually to produce basic coca paste. All of this is discharged into streams and rivers in the processing areas. Human exposure to both extractants and pesticides results in severe health problems.

Growers also indiscriminately use up to 3,500 tonnes of pesticides—mainly insecticides—every year. This is much more than the amount of herbicides that would be needed to eradicate all of the coca in Peru, the experts noted.

The impact on the environment is huge: loss of species diversity, soil erosion, destruction of forests to create coca plantations, and the contamination of soil, water and air by extraction chemicals, pesticides and smoke from the burning of cut-down forests.

Opium poppy cultivation causes similar damage to vital ecosystems. And cultivation is probably increasing.

CHEMICAL CONTROL

In the last 10 years, world-wide efforts to develop safe chemical and biological agents for plant

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eradication have greatly advanced, the experts said. Many of the agents developed have found successful practical application in various areas of agronomy, including the restoration of environmental balance.

Herbicides that are both highly effective and environmentally safe are now available. And biological control has progressed to the point where there is a real potential for developing agents suitable for destroying narcotic crops.

Certain chemicals have been proved effective in controlling cannabis. Others are widely used against the opium poppy. When used properly, according to manufacturers' specifications and national guidelines, these herbicides have a low negative environmental impact.

Field trials of two herbicides—tebuthiuron and hexazinone—have shown that coca could for the first time be controlled in an environmentally acceptable way. These chemicals have given excellent results, at relatively low rates, when applied as granules.

Studies have shown that, after tebuthiuron treatment, regeneration of grass and herbs is rapid and vigorous. Some 16 species belonging to 11 plant families have regenerated during the studies, suggesting low environmental hazard. And there has been no sign of toxic effects on vegetation bordering the treated coca plantation. Such herbicides offer exciting potential for coca eradication, the experts said.

A dye commonly used as a pharmaceutical colourant and in cosmetics may become a new control agent for cannabis. The dye has been proved effective when applied through nozzle blowers and aerosol sprays. Field trials using spray equipment mounted on helicopters have confirmed its suitability. The dye seems to have little effect, other than some leaf browning, on non-targeted plant species.

BIOLOGICAL CONTROL

Biological agents are equally promising. Among them is a moth which is a common pest of coca in Peru and Colombia. The larva of this moth is a voracious feeder on coca leaves and is a major reason for heavy use of insecticides by coca growers. The moth completes its life cycle in 30 days and breeds repeatedly throughout the year. These characteristics suggest a great potential as a biocontrol agent for coca.

Earlier studies under the aegis of the UN Division of Narcotic Drugs have identified several fungal pathogens. More than 40 such fungi are found on cannabis and coca, and more than 30 on the opium poppy. Several have characteristics which suggest value as biocontrol agents. Two of them might for instance be used against cannabis.

The development of agents with specific characteristics is being studied. In the case of insects, as strains resistant to insecticides are probably developing naturally, there is a good chance of achieving this by selection and rearing in the laboratory. Other characteristics, such as high fecundity, can also be selected.

Technology can greatly improve the effectiveness of fungi. Besides methods to isolate strains of high virulence, simple mutations and adaptations as well as fusion techniques offer great opportunities.

For example, a lethal fungal pathogen of over 40 weed species and of many crops has been manipulated to produce a strain which has an absolute need for cytosine, without which it cannot survive, thus offering an excellent eradicating agent with precise control possibilities. When applied with cytosine, the strain kills plants in the target area; without cytosine it is inactive and cannot spread to other areas from the site where applied.

A second strain does not produce sclerotia—resistant structures essential to withstand winter—or spores, which are necessary for dispersal. Thus, when applied, this strain kills plants in the target area but does not spread beyond it, and then dies during the winter. Such organisms are very effective as herbicides and have a low impact on the environment since they are short-lived and do not go beyond the target area.

HIGH POTENTIAL

To counter the environmental damage resulting from drug cultivation and production, the experts recommended that the United Nations promote the use of various eradication technologies as one approach to reducing illicit supply.

Concerns about the environmental risks should be seen in a wider context. Drug plant production and processing have a much greater impact on the environment, and on human health, than the methods applied in any eradication programme. Careful application of approved herbicides by properly trained staff will ensure a very low environmental impact, the experts concluded.

Also, biological control can greatly contribute to eradication programmes, the experts said. Biological methods must be promoted, though it is recognized that they will not replace the use of herbicides in some situations.

But the high potential of biological control can be realized only if an effective research programme is established. Such a programme must consider agents already known, and search for new ones among insects and fungal pathogens.

The experts recommended the creation of an international research project containing a comprehensive range of coordinated research programmes. This approach, involving international organizations and institutions with the support of the United Nations, provides a good basis for developing research programmes, including field trials, at various locations. The UN Commission on Narcotic Drugs in February 1990 took note of the experts' recommendations.

The need for drug eradication programmes safeguarding human health and preserving the ecosystem was also stressed in the Declaration of the World Ministerial Summit to Reduce the Demand for Drugs and to Combat the Cocaine Threat, organized by the United Kingdom in association with the United Nations in London in April 1990.

Published by the United Nations Department of Public Information
DPI/1133—91-12418—April 1991—5M